

DISTRIBUTIONAL STUDIES OF MASSACHUSETTS BRYOPHYTES

BRENT D. MISHLER AND NORTON G. MILLER

ABSTRACT

Eighteen bryophytes new to Massachusetts and fifty-five additional new county records are reported, including the second collection of *Pseudocrossidium hornschurchianum* from the New World. Significant range extensions are briefly discussed in an annotated list, and additional noteworthy records are presented in an appendix. The bryophyte flora of the state as documented in the literature now stands at 329 species of mosses and 144 species of liverworts.

Key words: bryophytes, mosses, liverworts, floristics, phytogeography, autecology

Recent fieldwork in several parts of Massachusetts has led to the discovery of range extensions for a number of species of mosses and liverworts. These noteworthy collections are presented here to update the published catalogs of the moss and hepatic floras of Massachusetts (Hilferty, 1960; Evans, 1923). The ecological and biogeographic significance of the new distributional information is also discussed briefly.

Eighteen bryophytes new to the state, and twenty-three significant range extensions within the state are given in an annotated list. Thirty-two additional new county records are provided in an appendix. New records of *Sphagnum* are not given in this paper because these will be reported at a later time by Miller and Andrus.

Early publications treating the Massachusetts bryoflora are cited by Evans (1923) and Hilferty (1960). Judd (1980) studied bryophytes of the peat mat at Ponkapoag Pond, Canton, Norfolk County, and reported one new state record: *Plagiothecium laetum*. Schuster (1981) discussed probable late Pleistocene relict liverworts that grow in extremely limited microhabitats in the Green River valley, Colrain, Franklin County. He reported seven new state records: *Jungermannia cordifolia*, *Scapania gymnostomophila*, *Lophozia gillmanii*, *L. bantriensis*, *L. heterocolpos*, *L. badensis*, and *Pellia megaspora*.

The prevailing acidic soils and bedrock over much of the state result in a rather uniform bryoflora, especially east of the Connecticut Valley. However, Schuster's studies, as well as our own, indicate that despite no lack of general collecting of bryophytes in Massa-

chusetts, there remains a great need for careful collecting at ecologically special sites. The studies summarized here are certainly not exhaustive; further work at these and similar places will be productive.

A few small and scattered exposures of marble occur among the predominant granites, gneisses, and schists of eastern Massachusetts. Cook (1974) presented detailed geological studies of the pre-Devonian Nashoba Formation, a northeast-southwest trending belt of lenses of siliceous marble and dolomite. Using topographic maps presented by Cook, we located several occurrences of rocks of this formation. Most were roadcuts or old quarries, some of which proved to be quite disturbed and barren of all but weedy species of bryophytes. However, the following occurrences of the Nashoba Formation (discussed below) produced significant collections of calcicolous bryophytes: Bolton, Boxborough, and Estabrook Woods.

The Third A. LeRoy Andrews Bryological Foray, organized and led by N. G. Miller in 1978, visited two interesting and imperfectly collected sites in central Massachusetts: Roaring Mountain, a site with a steep, extensive outcrop of conglomerate (calcareous in places); and Tom Swamp, a large bog and associated black spruce-tamarack forest. During pre-foray exploration, the foray itself, and later studies of the vegetation of Tom Swamp by Miller and R. H. W. Bradshaw, several state and numerous county records were noted, as discussed below.

Western Massachusetts provides the only extensive marble deposits in the state, and these occur in north-south trending bands in valleys between the Taconic Range and the Berkshire Mountains. Bartholomew's Cobble along the Housatonic River in the southwestern corner of the state has long been famous for its highly diverse flora (Arnold & Bailey, 1965). Six hundred and eighty-eight taxa of tracheophytes, including fifty-one ferns and fern allies, occur on the approximately 250 acres of the Bartholomew's Cobble Reservation (Boutard & VanWart, 1981). The habitat diversity responsible for this remarkable flora is provided in part by a mixture of dolomitic marble and quartzite that forms steep, rocky knolls with many ledges and boulders (Arnold & Bailey, 1965). Because the bryophyte flora was little-known, collections were made by one of us (BDM) as a contribution towards a revised list of the flora (to be published by

the Massachusetts Trustees of Reservations). In a two-day period 118 species of bryophytes (including 12 new to the state) were collected.

The following is an alphabetical list of localities at which collections were made.

Bartholomew's Cobble—Berkshire County: Bartholomew's Cobble Reservation, Ashley Falls, 4 mi. S of Sheffield, along the Housatonic River, ca. 700 ft. elev.

Bolton—Worcester County: abandoned limestone quarries, 2.4 mi. E of Bolton Center, off Route 117, ca. 300 ft. elev.

Boxborough—Middlesex County: abandoned limestone quarry, 0.7 mi. SW of Liberty Square in Boxborough, on E side of Hill Road, ca. 330 ft. elev.

Breakheart—Essex County: Breakheart Reservation, ca. 2 mi. NW of Saugus, NE corner of Reservation near small pond in Saugus River drainage, ca. 50 ft. elev.

Estabrook Woods—Middlesex County: abandoned limestone quarries, Estabrook Woods, Concord Field Station of the Museum of Comparative Zoology, Harvard University, ca. 4 mi. N of Concord Center, on W side of Estabrook Road, ca. 240 ft. elev.

Roaring Mountain—Franklin County: E slope of Roaring Mountain, southern edge of Mt. Toby State Forest, ca. 7 mi. S of Millers Falls on Route 63, 450-800 ft. elev.

Sudbury River—Middlesex County: between Martha's Point and Lee's Cliff, W side of Sudbury River, ca. 3 mi. S of Concord Center, ca. 130 ft. elev.

Tom Swamp—Worcester County: Tom Swamp, between Riceville and Brooks Ponds, Harvard Forest, ca. 2 mi. NW of Petersham, ca. 760 ft. elev.

An annotated list of species with range extensions of ecological and distributional significance follows. In the interest of completeness, additional new county records are listed in an Appendix. The sequence and nomenclature are according to Stotler and Crandall-Stotler (1977) for liverworts and Crum, Steere, and Anderson (1973)

for mosses. Voucher specimens for all of the reported taxa are on deposit in the Farlow Herbarium of Harvard University. Our individual collections are cited with initials (BDM or NGM) and collection number. New state records for Massachusetts are marked with an asterisk.

HEPATICAE

ADELANTHACEAE

Odontoschisma sphagni—Breakheart, *NGM 8206*; peaty soil, summit of a low ridge of soil extending out into a pond. The only other known collection from Massachusetts was reported by Schuster (1974) from Cape Cod, Barnstable Co. According to Schuster, this species is rare in North America with a strictly oceanic distribution from Newfoundland to Massachusetts.

JUBULACEAE

Frullania riparia—Bartholomew's Cobble, *BDM 1684*; Roaring Mountain, *NGM 8248*; face of steep rock outcrops and boulders. Cited by Evans (1923) only as a literature record. Widespread in eastern North America.

METZGERIACEAE

***Metzgeria furcata**—Bartholomew's Cobble, *BDM 1698, 1838*; on both basic and acidic rock. In North America, occurring on the West Coast and broadly in the East.

MUSCI

ANDREAEACEAE

Andreaea rupestris—Sudbury River, *NGM 8903*; dry face of bluff. Previously reported in Massachusetts from the Mt. Greylock region, Berkshire Co., and from Norfolk Co. Based on specimens annotated by W. Schultze-Motel in the Farlow Herbarium, the plants from Norfolk Co. can all be referred to *A. rothii*. In North America, *A. rupestris*

occurs across boreal and north temperate regions, particularly in mountainous areas of the East and West.

FISSIDENTACEAE

***Fissidens obtusifolius**—Bartholomew's Cobble, *BDM 1690*; marble boulder near stream (confirmed by R. A. Pursell). According to Crum and Anderson (1981), endemic to eastern North America, from Ontario and Massachusetts south.

Fissidens subbasilaris—Estabrook Woods, *NGM 8677*; Roaring Mountain, *NGM 8430*; soil, crevices and base of steep rock faces. Previously reported in Massachusetts only from Bristol Co.; widespread in eastern North America from New England and Ontario south (Crum & Anderson, 1981) and most often growing on tree trunks.

DICRANACEAE

***Dichodontium pellucidum**—Roaring Mountain, *Zander 4700*; dried up stream bed. Listed as doubtful for Massachusetts by Hilferty; a calcicole, widespread in northern and montane regions of North America.

ENCALYPTACEAE

Encalypta procera—Bartholomew's Cobble, *BDM 1711*; Estabrook Woods, *NGM 8672*; Roaring Mountain, *NGM 8428*; calcareous soil and rock. Previously reported in Massachusetts from Hampshire and Worcester Cos. Widespread across northern and eastern North America; expected in other regions of calcareous rock in the state.

POTTIACEAE

Gymnostomum aeruginosum—Roaring Mountain, *NGM 8241*; damp conglomerate boulder. An obligate calcicole, previously known in Massachusetts only from Berkshire Co.; widespread in North America.

- Trichostomum tenuirostre**—Estabrook Woods, *NGM* 8670; Roaring Mountain, *NGM* 8226; damp, vertical marble and conglomerate rock. Previously known in Massachusetts only from Berkshire Co.; widespread in North America.
- ***Hyophila involuta**—Bartholomew's Cobble, *BDM* 1788; wet marble boulder near stream; a calcicole, sporadically distributed throughout eastern North America.
- Didymodon rigidulus**—Estabrook Woods, *NGM* 8671; damp, vertical limestone. Previously known in Massachusetts only from Berkshire Co.; a calcicole, widely distributed in eastern North America.
- Bryoerythrophyllum recurvirostrum**—Bartholomew's Cobble, *BDM* 1858; Roaring Mountain, *NGM* 8421; Sudbury River, *NGM* 8907; rock and soil, usually calcareous and near water. Previously known in Massachusetts from Plymouth Co.; widespread in North America.
- Barbula convoluta**—Bartholomew's Cobble, *BDM* 1859; Bolton, *BDM* 3679; sunny, disturbed, calcareous soil. A calcicole, previously known in Massachusetts only from Bristol Co.; widespread in North America.
- ***Pseudocrossidium hornschuchianum**—Bartholomew's Cobble, *BDM* 1705; dry, sunny limestone outcrop (det. R. H. Zander). This is the second collection of *P. hornschuchianum* known to us from the New World; the only other station is a botanical garden in Vancouver, British Columbia (Tan, Zander & Taylor, 1981). The species is common in Europe at disturbed sites along roadsides and on stone walls (*ibid.*). The species may have been introduced from Europe, or it might occur unrecognized elsewhere in North America.
- ***Tortula mucronifolia**—Bartholomew's Cobble, *BDM* 1826, 3721; sunny calcareous sand over limestone, bank of river. Reported as doubtful for Massachusetts by Hilferty; occurs otherwise at scattered calcareous sites in New York and western Vermont; common further north, from Labrador and Greenland to Alaska, and south through the western United States.

Tortula ruralis—Bartholomew's Cobble, *BDM 1704*; thin soil over marble, in dry, sunny locations. The only other reported locality for this species in Massachusetts is Nahant, Essex Co., where there is a small outcrop of calcareous Cambrian limestone at East Point (G. Thompson, pers. comm.). A search of this locality in 1979 showed it to be devoid of *T. ruralis*. This moss is a calcicole, common in western North America and across Canada, especially in the Arctic; it occurs sporadically in the Great Lakes region, New York, and western Vermont.

Grimmia pilifera—Bartholomew's Cobble, *BDM 1741*; quartzite boulder. Reported by Hilferty only from eastern Massachusetts; throughout eastern North America.

BRYACEAE

Pohlia wahlenbergii—Bartholomew's Cobble, *BDM 1857*; Roaring Mountain, *NGM 8240*; moist soil and rock, bank of river and conglomerate outcrop. Previously reported in Massachusetts only from Bristol Co.; widespread in North America.

MNIACEAE

***Mnium medium**—Bartholomew's Cobble. *BDM 1766*; moist soil, base of limestone cliff. Widespread in North America.

Mnium thomsonii (*M. orthorrhynchum*)—Estabrook Woods, *NGM 8674*; Roaring Mountain, *NGM 8436*; damp calcareous rock in quarry, and soil at base of conglomerate rock. Previously known in Massachusetts only from Berkshire Co.; widespread in North America. According to Crum and Anderson (1981): "frequently but not always in calcareous habitats."

BARTRAMIACEAE

***Plagiopus oederiana**—Roaring Mountain, *NGM 8243*; rock, face of conglomerate outcrop. Listed as doubtful for Massachusetts by Hilferty. According to Crum and Anderson (1981), on cliffs and boulders (especially calcareous rock);

in North America occurring across the Arctic and south in montane or rocky areas to Oregon, Colorado, and Virginia.

ORTHOTRICHACEAE

***Zygodon viridissimus** var. **rupestris**—Bartholomew's Cobble, *BDM 1801*; sunny bark of old apple tree. In North America with a scattered but widespread distribution.

***Amphidium mougeotii**—Roaring Mountain, *Zander 4701*; rock ledges. Widespread on acidic rocks in mountainous regions of North America.

Orthotrichum anomalum—Bartholomew's Cobble, *BDM 1809*; Boxborough, *BDM 3680*; Estabrook Woods, *BDM 1621*; calcareous rock. Previously reported in Massachusetts from Bristol and Essex Cos. According to Vitt (1973), in North America across the North, in the East almost exclusively on calcareous rock north of the line of maximum glaciation, and in the West on both basic and acidic rock southward in the Rocky Mountains.

Orthotrichum pumilum—Bartholomew's Cobble, *BDM 1802*; sunny bark of old apple tree. Previously reported in Massachusetts from Bristol Co.; widespread in North America, mostly south of Canada.

FONTINALACEAE

***Fontinalis hypnoides**—Bartholomew's Cobble, *BDM 1765*; attached to rocks in slow moving brook. Widespread in northern and western North America.

LESKEACEAE

***Lindbergia brachyptera**—Bartholomew's Cobble, *BDM 1803*; sunny bark of old apple tree. Widespread in eastern North America.

Leskea gracilescens—Bartholomew's Cobble, *BDM 1800*; Roaring Mountain, *Allen 795*; bark of deciduous trees and on quartzite and conglomerate rock. Previously reported from Middlesex Co.; endemic to the deciduous forests of eastern North America.

THUIDIACEAE

Haplohymenium triste—Bartholomew's Cobble, *BDM 1693*; marble and quartzite ledges and cliffs. Previously reported only from Bristol Co.; widespread in eastern North America, but according to Crum and Anderson (1981), usually on trees and rarely on rock.

Anomodon minor—Bartholomew's Cobble, *BDM 1794*: shaded marble cliffs. Widespread in eastern North America, most often on trees but sometimes on calcareous rocks (Crum & Anderson, 1981).

***A. viticulosus**—Bartholomew's Cobble, *BDM 1670*; Roaring Mountain, *NGM 8415*; marble and conglomerate rock, in crevices of cliffs. Listed as doubtful for Massachusetts by Hilferty; a calcicole distributed throughout eastern North America.

***Thuidium pygmaeum**—Roaring Mountain, *NGM 8442*; damp face of rock bluff. Previously known from southern Ontario and New York south to Florida and Arkansas (Crum & Anderson, 1981).

AMBLYSTEGIACEAE

***Calliergon stramineum**—Tom Swamp, *NGM 8830*; shallow depression in peat. Listed as doubtful for Massachusetts by Hilferty. Widespread across Canada and the northern United States, this apparently represents the southernmost locality for the species in New England.

BRACHYTHECIACEAE

Brachythecium digastrum—Bartholomew's Cobble, *BDM 1699*; both tree stumps and marble. Previously reported from Bristol and Worcester Cos.; endemic to eastern North America.

Bryhnia graminicolor—Roaring Mountain, *NGM 8447*; ledge of conglomerate bluff. Previously reported in Massachusetts only from Berkshire Co. Endemic to eastern North America, often on calcareous soil or rock (Crum & Anderson, 1981).

SEMATOPHYLLACEAE

***Brotherella tenuirostris**—Bartholomew's Cobble, *BDM 1841*; quartzite boulder. Endemic to eastern North America.

HYPNACEAE

Platygyrium repens—Bartholomew's Cobble, *BDM 1712, 1757*; fallen logs and on rock. Common in central and eastern Massachusetts; widespread in northern and eastern North America.

Hypnum lindbergii—Bartholomew's Cobble, *BDM 1830*; moist soil near river or springs. Previously reported from Massachusetts only in the east; widespread in North America.

***Isopterygiopsis muelleriana**—Tom Swamp, *NGM 8821*; base of tree in wooded bog. In North America occurring in western and eastern Canada and in mountainous habitats in the eastern United States (Crum & Anderson, 1981).

***Taxiphyllum deplanatum**—*Bartholomew's Cobble, BDM 1814*; Roaring Mountain, *NGM 8435*; moist soil near river or springs, and rock in talus below bluff. Endemic to North America, restricted to the east except for localities in Arizona and New Mexico (Ireland, 1969). According to Crum and Anderson (1981), the habitat is usually rock, nearly always calcareous in the northern part of the range.

ACKNOWLEDGMENTS

We would like to thank Bruce Allen, Ronald Pursell, and Richard Zander, all of whom participated in the 1978 Andrews Bryological Foray, for providing verifications, voucher specimens, or permission to cite certain of their collections. Ray Angelo, Anthony Boutard, and Gary Thompson kindly provided assistance and information for our fieldwork. Published in part as New York State Science Service Journal Series No. 421.

LITERATURE CITED

- ARNOLD, H. J., & S. W. BAILEY. 1965. Bartholomew's Cobble, Sheffield, Massachusetts: Its geology, fauna and flora. Massachusetts Trustees of Reservations, Milton, Massachusetts.
- BOUTARD, A., & G. F. VANWART. 1981. Checklist of vascular plants of Bartholomew's Cobble, Ashley Falls, Massachusetts. Massachusetts Trustees of Reservations, Milton, Massachusetts.
- COOK, L.P. 1974. Metamorphosed carbonate rocks of the Nashoba Formation, eastern Massachusetts. Ph.D. Dissertation, Harvard University, Cambridge, Massachusetts.

- CRUM, H. A., & L. E. ANDERSON. 1981. Mosses of eastern North America. 2 volumes. Columbia University Press, New York.
- , W. C. STEERE, & L. E. ANDERSON. 1973. A new list of mosses of North America north of Mexico. *Bryologist* **76**: 85-130.
- EVANS, A. W. 1923. Second revised list of New England Hepaticae. *Rhodora* **25**: 192-199.
- HILFERTY, F. J. 1960. The mosses of Massachusetts: a county catalogue with annotations. *Rhodora* **62**: 145-173.
- IRELAND, R. R., JR. 1969. A taxonomic revision of the genus *Plagiothecium* for North America, north of Mexico. *Natl. Mus. Canada Publ. Bot.* **1**: 1-118.
- JUDD, W. S. 1980. Bryophytes of the peat mat at Ponkapoag Pond, eastern Massachusetts, with taxonomic and ecological notes on *Sphagnum*. *Rhodora* **82**: 563-578.
- SCHUSTER, R. M. 1974. The Hepaticae and Anthocerotae of North America east of the Hundredth Meridian. Volume III. Columbia University Press, New York.
- . 1981. Late Pleistocene bryological relicts in western Massachusetts. *Rhodora* **83**: 441-448.
- STOTLER, R., & B. CRANDALL-STOTLER. 1977. A checklist of the liverworts and hornworts of North America. *Bryologist* **80**: 405-428.
- TAN, B. C., R. H. ZANDER, & T. TAYLOR. 1981. *Pseudocrossidium hornschuchianum* and *P. revolutum* var. *obtusulum* in the New World. *Lindbergia* **7**: 39-42.
- VITT, D. H. 1973. A revision of the genus *Orthotrichum* in North America, north of Mexico. *Bryophytorum Bibliot.* **1**: 1-208 + 60 plates.

BDM

FARLOW HERBARIUM
HARVARD UNIVERSITY
CAMBRIDGE, MASSACHUSETTS 02138

NGM

BIOLOGICAL SURVEY
NEW YORK STATE MUSEUM
THE STATE EDUCATION DEPARTMENT
ALBANY, NEW YORK 12230

Appendix. Additional Massachusetts County Records
Voucher specimens deposited in FH.

1. Franklin County (Roaring Mountain):
Brachythecium oxycladon—NGM 8227
B. salebrosum—NGM 8420

Bryum pseudotriquetrum—NGM 8422
Campylium chrysophyllum—NGM 8423
Climacium americanum—BDM 1257
Dicranum fulvum—NGM 8228
D. montanum—BDM 1262
Diphyscium foliosum—BDM 1242
Eurhynchium pulchellum—BDM 1283
Fissidens cristatus—NGM 8429
Grimmia alpicola var. *rivularis*—BDM 1260
Homomallium adnatum—NGM 8224
Isopterygium elegans—NGM 8234
Leucobryum glaucum—BDM 1274
Mnium affine—BDM 1247
M. marginatum—NGM 8232
M. stellare—NGM 8230
Paraleucobryum longifolium—BDM 1279
Platygyrium repens—NGM 8229
Timmia megapolitana—NGM 8444
Tortella humilis—NGM 8446
Ulota hutchinsiae—BDM 1264

2. Worcester County (Tom Swamp):

Anacamptodon splachnoides—NGM 8777
Cephalozia pleniceps [not listed by Evans, 1923; but reported from
Worcester County by Schuster, 1974]—NGM 8717
Herzogiella turfacea—NGM 8714
Hypnum fertile—BDM 1293

3. Worcester County (Bolton):

Barbula unguiculata—BDM 3669
Bryum liseae var. *cuspidatum*—BDM 3675
Mnium marginatum—NGM 8916
M. stellare—NGM 8935
Tortella humilis—NGM 8929
Weissia controversa—BDM 3674